Imaging of non-neoplastic intratesticular masses

Shweta Bhatt, Syed Zafar H. Jafri, Neil Wasserman, Vikram S. Dogra

ABSTRACT
The use of high-frequency ultrasound is increasing for the treatment of cystic, vascular, and solid non-neoplastic intratesticular masses. Cystic lesions examined include simple testicular cysts, tunica albuginea cysts, epidermoid cysts, tubular ectasia of rete testis, and intratesticular abscesses. Vascular lesions examined include intratesticular varicocele and intratesticular arteriovenous malformations. Solid lesions examined include fibrous pseudotumor of the testis, focal or segmental testicular infarct, fibrosis of the testis, testicular hematoma, congenital testicular adrenal rests, tuberculoma, and sarcoidosis. Gray-scale and color-flow Doppler sonography facilitate the visualization of the benign characteristics of the lesions. Magnetic resonance imaging can also help as a problem-solving modality in some cases.

Key words: • ultrasonography • testis • radiology

High-frequency ultrasonography is the first modality of choice for the evaluation of scrotal pathology. The use of high-frequency ultrasound is increasing, allowing detection and better characterization of many benign intrascrotal lesions that can be treated with non-surgical management or testicular-sparing surgery.

This pictorial essay presents gray-scale and color-flow Doppler features of non-neoplastic intratesticular masses. For ease of understanding, the review is organized into three major categories: cystic, vascular, and solid non-neoplastic masses. Table summarizes the key sonographic features, each with recommended management.

Sonographic anatomy of the testis

The normal adult testes in each hemi scrotum are symmetric in size and measure approximately 5x3x2 cm. On ultrasound, a normal testis is identified by the presence of homogeneous, medium-level echoes and is contained by a fibrous sheath called the tunica albuginea. The tunica albuginea is identified on ultrasound as a thin echogenic line around the testis and is externally covered by the tunica vaginalis. The tunica vaginalis consists of visceral and parietal layers that are normally separated by a few milliliters (2–3 mL) of fluid. The tunica attaches to the scrotal wall at the posterolateral aspect of the testis. From the posterior aspect of the testis, the tunica albuginea invaginates within the testis to form an incomplete septum, called the mediastinum testis. Sonographically, the mediastinum testis appears as an echogenic band of variable thickness that extends across the testis in the longitudinal axis (Fig. 1). Multiple fibrous septa extend from the mediastinum into the testis, dividing it into 250 to 400 lobules. Spermatogenesis occurs within the seminiferous tubules contained within these lobules. The seminiferous tubules open into dilated spaces called the rete testis within the mediastinum via the tubuli recti. The normal rete testis can be seen on high-frequency US in 18% of patients. (1). The rete testis drains into the epididymis via 10 to 15 efferent ductules.

There are four testicular appendages (remnants of the mesonephric and paramesonephric ducts): the appendix testis (hydatid of Morgagni), the appendix epididymis, the vas aberrans, and the paradidymis. The appendix testis and the appendix epididymis are commonly seen on scrotal US. The appendix testis is a small ovoid structure usually at the upper pole of the testis in the groove between the testis and the epididymis, better seen by the presence of fluid around the testis.

The testes are supplied by testicular arteries that arise from the abdominal aorta. The testicular arteries enter the spermatic cord at the deep inguinal ring and continue along the posterior surface of the testis, penetrating the tunica albuginea and forming the capsular arteries that course through the tunica vasculosa, which underlies the tunica

From the Department of Imaging Sciences (S.B., V.S.D. ✉ *Vikram_Dogra@urmc.rochester.edu*), University of Rochester Medical Center, New York, USA; the Department of Radiology (S.Z.H.J.), William Beaumont Hospital, Miami, USA; and the Department of Radiology (N.W.), Veterans Affairs Medical Center, Minneapolis, USA.

Table. Non-neoplastic intratesticular masses: sonographic features and management

| Intratesticular mass	Sonographic features	Management
Simple cyst	Anechoic, imperceptible wall, through transmission, avascular	Conservative; surgery if symptomatic
Tunica albuginea cyst	Cyst at upper or lateral margin of testis; may be calcified	Conservative
Epidermoid cyst	Classic appearance: onion ring	Enucleation
Tubular ectasia	Avascular cystic spaces in the rete testis	No management
Testicular abscess	Mixed echogenic lesion with shaggy walls, fluid fluid level, low level echoes within	Conservative with antibiotics; if does not respond, surgery is performed.
Intratesticular varicocele	Anechoic, tortuous structure with a venous waveform	No management
Intratesticular AVM	Hypoechoic lesion with mosaic of colors and arteriovenous waveform	Surgery if symptomatic
Focal testicular infarct	Avascular hypoechoic area in the testis	Conservative
Testicular fibrosis	Hypo/hyperechoic avascular nodules or hypoechoic striations or diffuse heterogeneity	No management
Testicular hematoma	Avascular hyperechoic when acute or heterogeneous when chronic	Conservative when small; surgery is indicated in case of a large hematoma or when symptomatic
Testicular hamartomas (Cowden disease)	Multiple bilateral, hyperechoic lesions	No management
Congenital testicular adrenal rests	Bilateral hypoechoic or hyperechoic lesions with or without posterior acoustic shadowing	Conservative
Tuberculosis	Variable; orchitis, nodules, or abscess	Conservative with anti-tuberculous drugs
Sarcoidosis	Multiple bilateral hypoechoic nodules involving both the testis and epididymis	Conservative

AVM, arteriovenous malformation
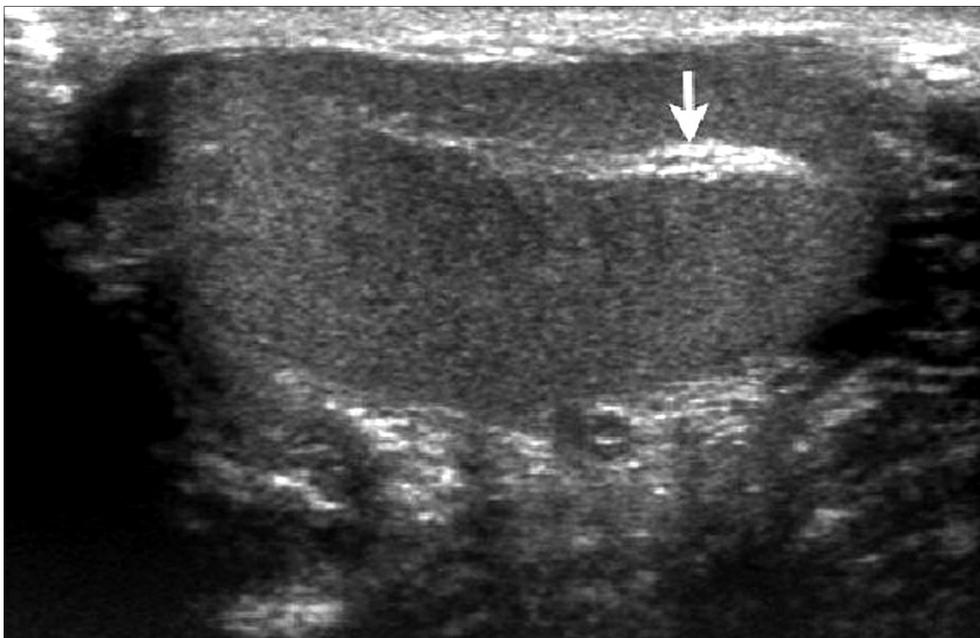
Figure 1. Normal testis. Longitudinal gray scale sonogram of the testis demonstrates the mediastinum testis *(arrow)* seen as an echogenic line traversing through the testis.
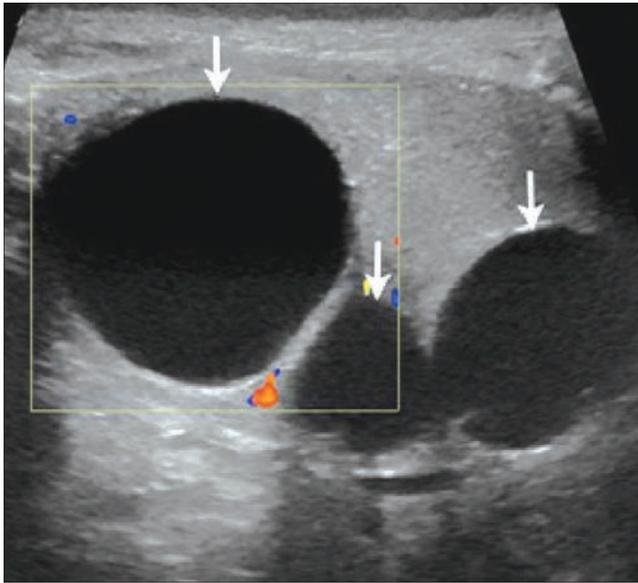
Figure 2. Simple testicular cysts. A 45-year-old male presented with a dull ache in the left scrotum. Color flow Doppler sonogram of the left testis demonstrates multiple cystic areas *(arrows)* within the left testis that have an imperceptible wall, anechoic centers, posterior through transmission, and absent internal vascularity.
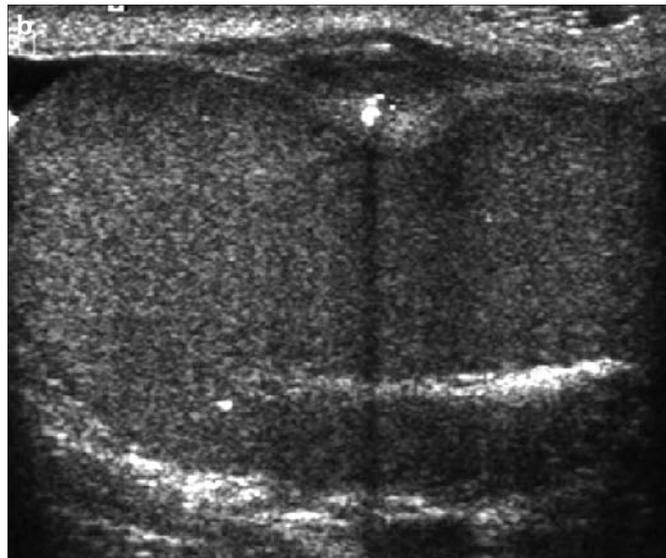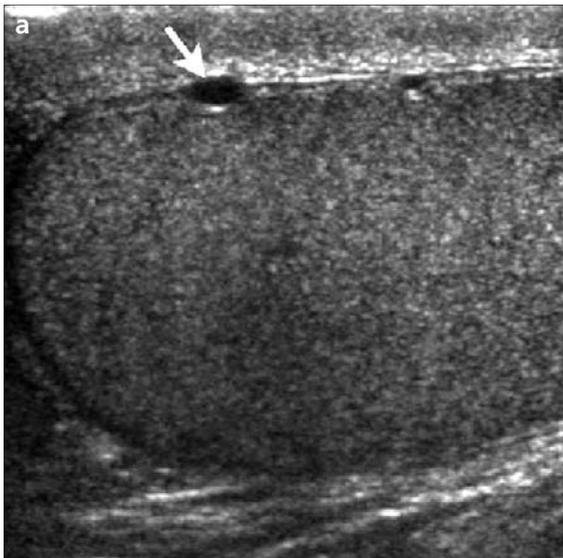

Figure 3. a, b. Tunica albuginea cysts. A 40-year-old male who presented with a palpable lump in the testis **(a)**. Longitudinal gray-scale sonogram of the testis demonstrates a cyst *(arrow)* in the supero-anterior part of testis within the two layers of tunica albuginea. A 38-year-old male who presented with scrotal swelling and a palpable lump in the testis **(b)**. Longitudinal sonogram of the left scrotum demonstrates a partially calcified tunica albuginea cyst.

albuginea. Branches from the capsular arteries carry blood toward the mediastinum and divide to form the recurrent rami that then carry blood from the mediastinum into the testis. A transmediastinal branch of the testicular artery is present in approximately one-half of normal testes. It traverses through the mediastinum to supply the capsular arteries and is usually accompanied by a large vein. The testicular veins exit from the mediastinum and drain into the pampiniform plexus, which also receives venous drainage from the epididymis and scrotal wall. These vessels join together as they pass through the inguinal canal and form single testicular veins on each side, ultimately draining into the vena cava on the right side and the left renal vein on the left side of the body.

Cystic lesions
Simple testicular cysts

Testicular cysts occur in approximately 8% to 10% of patients (2). Benign cysts are often incidentally found and are generally not palpable (3). They usually occur near the mediastinum testis and are associated with extratesticular spermatoceles (4, 5). On ultrasound, simple cysts have an imperceptible wall, an anechoic center, and through transmission, with sizes ranging from 2 mm to 2 cm in diameter (Fig. 2) (4).

Tunica albuginea cysts

Tunica albuginea cysts are benign and arise from within the leaves of the tunica albuginea. By virtue of their location, these cysts are almost always palpable despite being very small in size, ranging from 2 to 7 mm (Fig. 3a) (4, 6). These cysts meet the criteria for a simple cyst by ultrasound but sometimes may be calcified or even contain milk of calcium (Fig. 3b) (7).
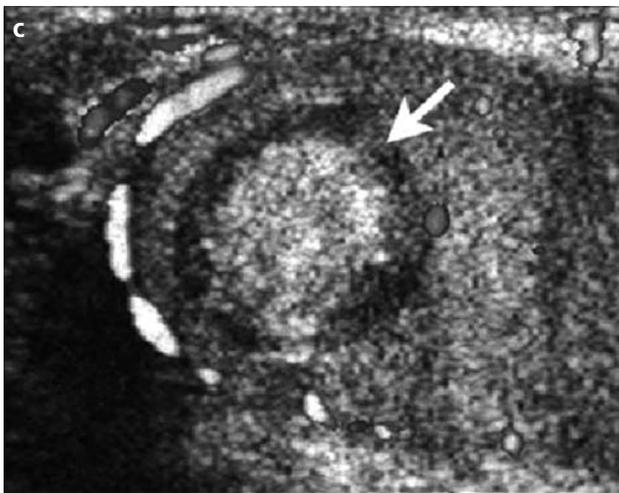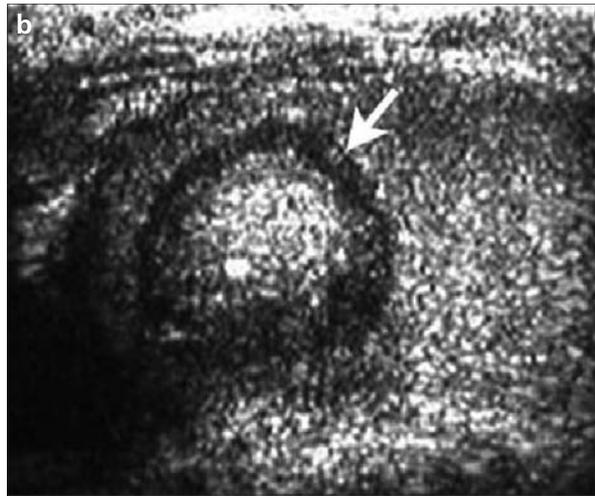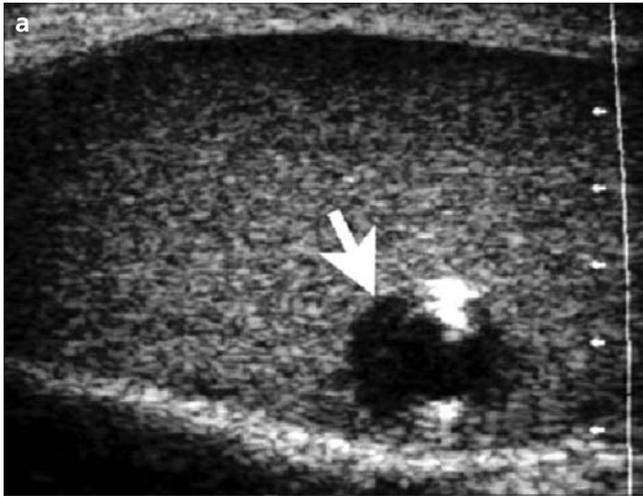
Figure 4. a–c. Epidermoid cysts. A 25-year-old male with a palpable lump in the left testis **(a)**. Longitudinal gray-scale sonogram of the testis demonstrates the characteristic sonographic appearance of the epidermoid cyst *(arrow),* which is seen as an onion ring configuration due to alternating layers of hypo- and hyperechogenicity. (Reprinted with permission from reference 4.) Atypical appearance of epidermoid cyst seen in a 16-year-old male who presented with a hard tender nodule in right testis **(b, c)**. Gray-scale **(b)** and corresponding color Doppler **(c)** images demonstrate a smooth, spherical, well-circumscribed nodule with a hypoechoic rim *(arrow)* and a hyperechoic center (target appearance) as well as the presence of only peripheral vascularity.
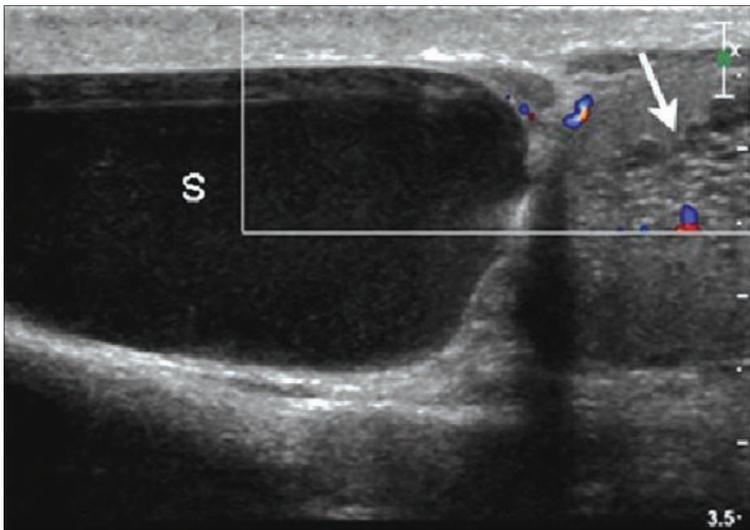

Figure 5. Tubular ectasia of rete testes. A 70-year-old male with left testicular mass. Longitudinal gray scale image of left testis demonstrates multiple, anechoic, avascular areas *(arrow)* located postero-laterally near the mediastinum of testis. Associated ipsilateral spermatocele (S) is also seen.

Epidermoid cysts

Epidermoid cysts of the testis are rare, benign testicular tumors with varied sonographic appearances secondary to the variability in maturation and quantity of keratin (8). Epidermoid cysts usually present between 20 to 40 years of age and can range from 1 to 3 cm in size (9). Four sonographic appearances of epidermoid cysts have been described, but the classic onion ring appearance is considered characteristic (Fig. 4) and corresponds with the natural evolution of the epidermoid cyst (4, 10). There is only one report in the literature that has suggested that this so-called "classic appearance of epidermoid cysts" can be seen in teratomas (11).

An epidermoid cyst of less than 3 cm in size with negative tumor markers can be managed conservatively by enucleation provided that frozen sections are obtained to confirm the diagnosis and that two biopsies of the surrounding parenchyma show no testicular involvement (12).

Tubular ectasia of rete testis

Tubular ectasia, also known as cystic transformation of rete testis, is a dilatation of the rete testes as a result of partial or complete obliteration of the efferent ductules (4). It usually affects men over the age of 50. It is often bilateral and asymmetric, and it is identified by its typical location in or around the mediastinum testis. On ultrasound, it is seen as multiple anechoic, avascular structures within the mediastinum and is often associated with ipsilateral spermatoceles (Fig. 5) (4). It is important to differenti-
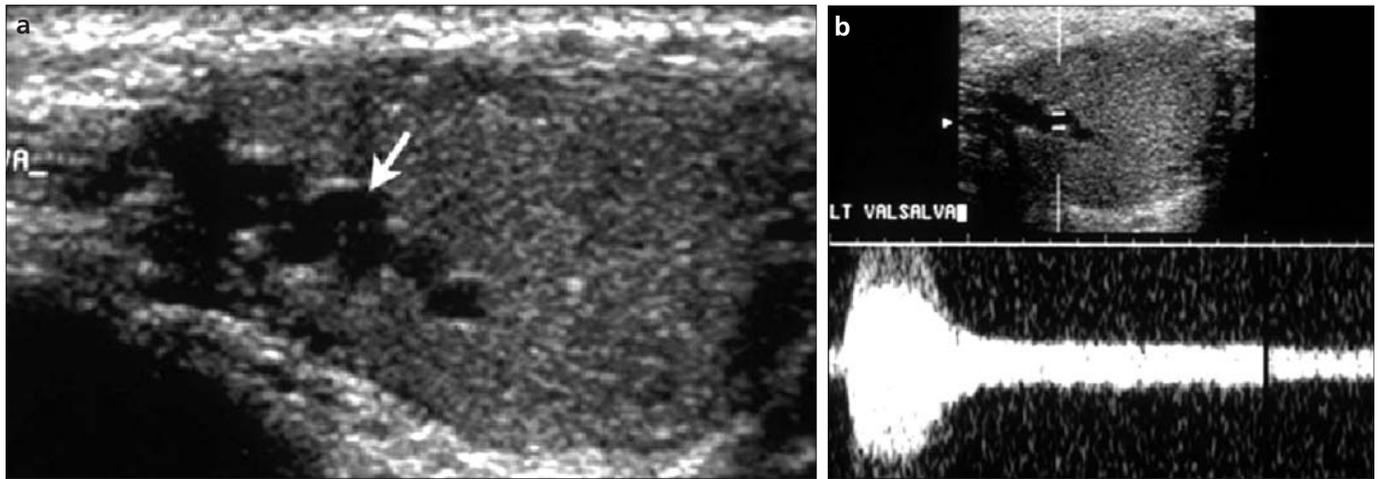
Figure 6. a, b. Intratesticular varicocele. A 28-year-old male with testicular pain. Longitudinal gray scale sonogram **(a)** of the testis demonstrates anechoic tubular structures within the testis. Corresponding color Doppler image **(b)** shows presence of a venous flow pattern with an increase in amplitude with Valsalva maneuver. Intratesticular varicoceles are often associated with extratesticular varicoceles. (Reprinted with permission from reference 62.)

ate this benign entity from malignant cystic tumors of the testis and thus avoid unnecessary orchidectomy. Cystic malignant tumors, most commonly the teratomas, can be distinguished sonographically by the presence of multiple cystic areas, often surrounded by a soft tissue rind. They are almost always unilateral and are not limited to the mediastinum (13). They can be further confirmed by measuring serum tumor markers.

Intratesticular abscess

An intratesticular abscess most frequently results from epididymo-orchitis and less commonly from a superadded infection in post-traumatic testicular hematomas and testicular infarcts (10). Patients with an intratesticular abscess present with an acutely painful scrotum and associated fever. Ultrasonography is the imaging modality of choice and demonstrates a hypoechoic lesion within the testis marked by low-level echoes and shaggy margins. Color flow Doppler demonstrates absent internal vascularity with increased peripheral hyperemia (Fig. 6) (4).

Vascular lesions

Intratesticular varicocele

Intratesticular varicocele is a rare and relatively new entity, reported in fewer than 2% of symptomatic men undergoing testicular sonography as opposed to extratesticular varicoceles, which are present in 15% to 20% of men (14, 15). Patients with intratesticular varicocele may have testicular pain secondary to venous congestion, resulting in stretch-

ing of the tunica albuginea. Intratesticular varicoceles are usually associated with extratesticular varicoceles and their location may be subcapsular (under the tunica albuginea) or adjacent to mediastinum testis (16).

The sonographic features of intratesticular varicoceles are similar to those of extratesticular varicoceles. Gray-scale sonography demonstrates tubular or serpentine structures more than 2 mm in diameter with a positive Valsalva maneuver, confirming the venous origin (Fig. 7) (15, 17).

Color flow Doppler also facilitates the visualization intratesticular varicoceles. A Valsalva maneuver is very important as some of the vessels may not show spontaneous flow. Intratesticular varicoceles adjacent to the mediastinum testis may mimic tubular ectasia; however, color flow Doppler helps to differentiate between the two (18).

Intratesticular arteriovenous malformation (AVM)

Intratesticular AVM is a rare benign entity (18). Its pathogenesis may be congenital or post-traumatic (19). Its sonographic appearance on gray scale is hypoechoic with a characteristic arterialized venous spectral waveform (Fig. 8) (20). The arteriovenous type of an intratesticular hemangioma should be considered in the differential diagnosis (21).

Solid lesions

Fibrous pseudotumor of the testis

A fibrous pseudotumor is a painless tumor of the tunica that clinically

mimics testicular and paratesticular neoplasms. Almost three-fourths of these pseudotumors arise from the tunica vaginalis, and the remainder arises from the epididymis, spermatic cord, or tunica albuginea (22). Patients are usually in the third decade of life, but these lesions have been observed over a wide age range (7–95 years) (23). Fibrous pseudotumor of the testis is not a neoplasm but rather a benign fibroinflammatory reaction that results in the formation of one or more nodules, diffuse thickening, or a plaque-like process of the testicular capsule (24). Patients typically present with a painless scrotal lump of widely varying size or unilateral scrotal swelling (25). Pseudotumors are usually associated with hydrocele, history of trauma, or infection, particularly with the bacterium *Schistosoma hematobium* (26).

The sonographic appearance of fibrous pseudotumors is widely variable and depends upon the fibrous and cellular tissue present. The proliferation of fibrous and cellular tissue can appear as a well-defined hyperechoic or hypoechoic mass on ultrasound, and there is no other specific appearance (Fig. 9) (27, 28). Because of the fibrous pseudotumor's sonographic similarity to malignant neoplasms, patients with these tumors usually undergo a radical orchiectomy.

Focal/segmental testicular infarct

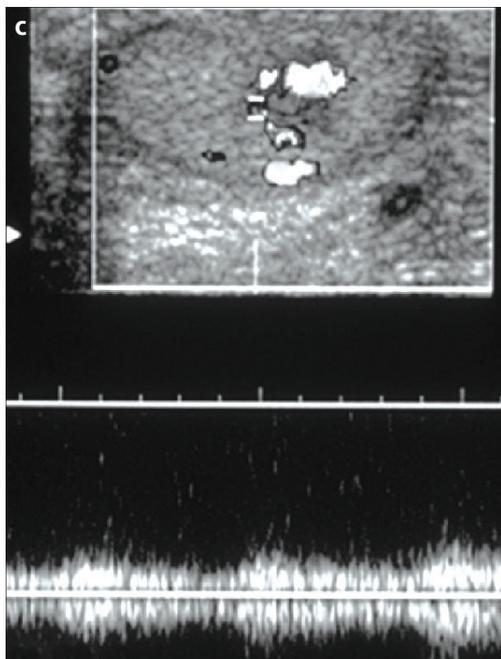Focal or segmental testicular infarction is rare. It typically occurs during
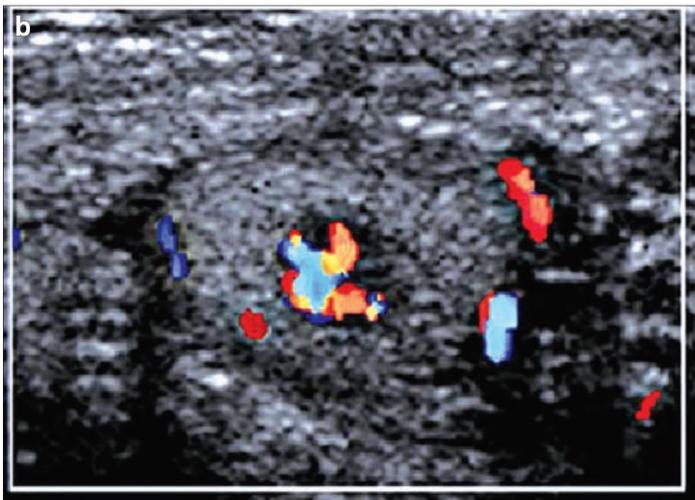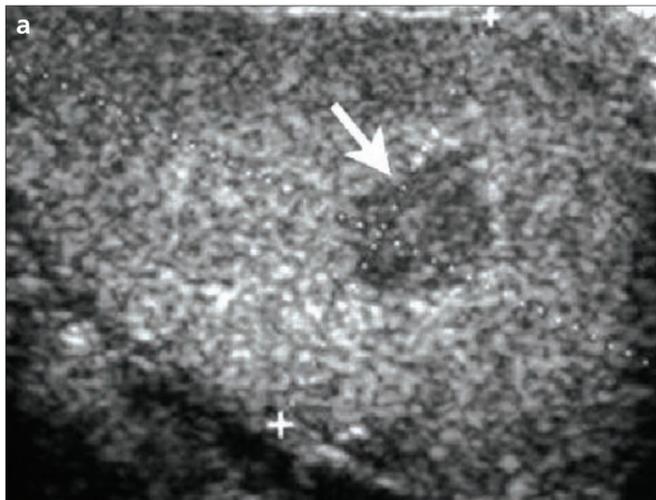
Figure 7. a–c. Intratesticular arterio-venous malformation (AVM). A 32-year-old male with left scrotal pain. Gray-scale image **(a)** of the testis demonstrates a hypoechoic lesion *(arrow).* On the corresponding color flow **(b)** and spectral **(c)** Doppler images, this lesion fills with a mixture of colors and shows an arterialized–venous waveform pattern consistent with an AVM. (Reprinted with permission from reference 19.)
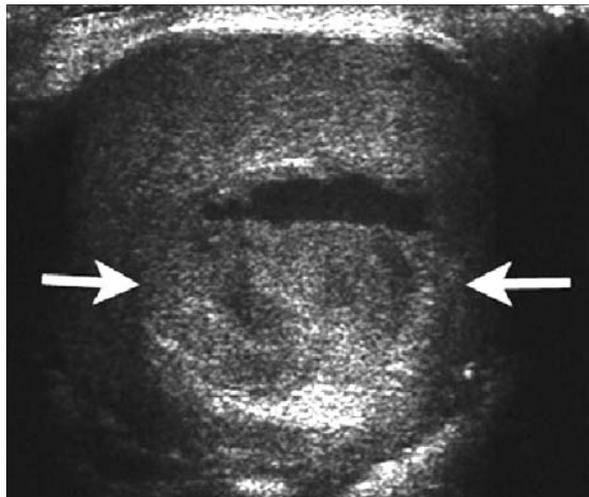

Figure 8. Testicular abscess. A 35-year-old male with testicular pain and fever. Tranverse gray scale image of the left testis demonstrates a complex cystic lesion *(arrows)* within the testis that has shaggy margins and a fluid-fluid level within.
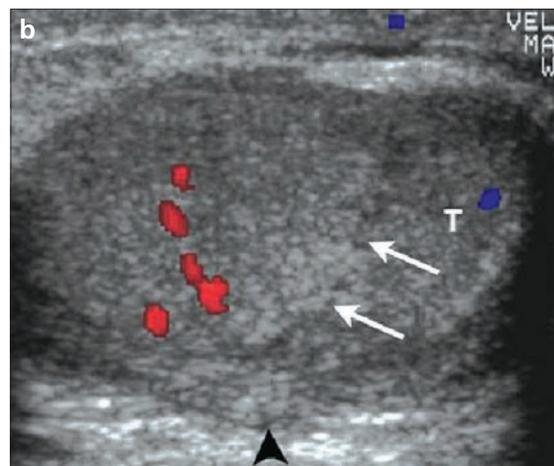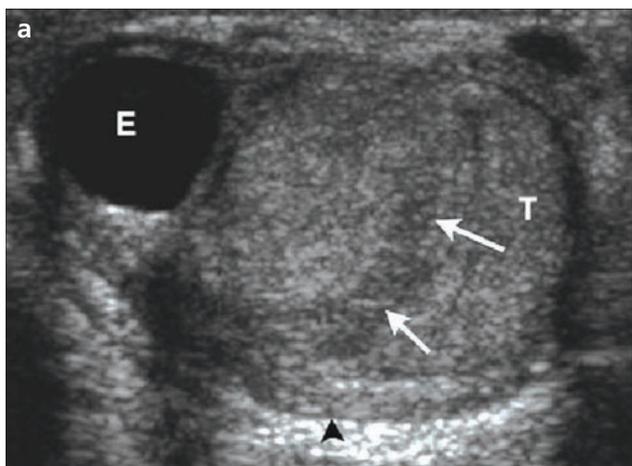

Figure 9. a, b. Fibrous pseudotumor of the testis (surgically confirmed). A 59-year-old male with a paplpable left testicular mass. Transverse gray scale **(a)** and longitudinal color flow Doppler image **(b)** of the left testis and epididymis demonstrate variable echotexture with areas of hypoechogenicity within the testicular parenchyma *(arrows)*. A rind of soft tissue *(arrowhead)* is seen surrounding the testis in the expected location of the tunica albuginea. T, testis; E, epididymal cyst. Histopathology revealed small areas of parenchymal scarring with a markedly thickened capsule composed of dense collagenous fibrous tissue. There was scarring and atrophy of the testicular parenchyma adjacent to the thickest portion of the capsule.
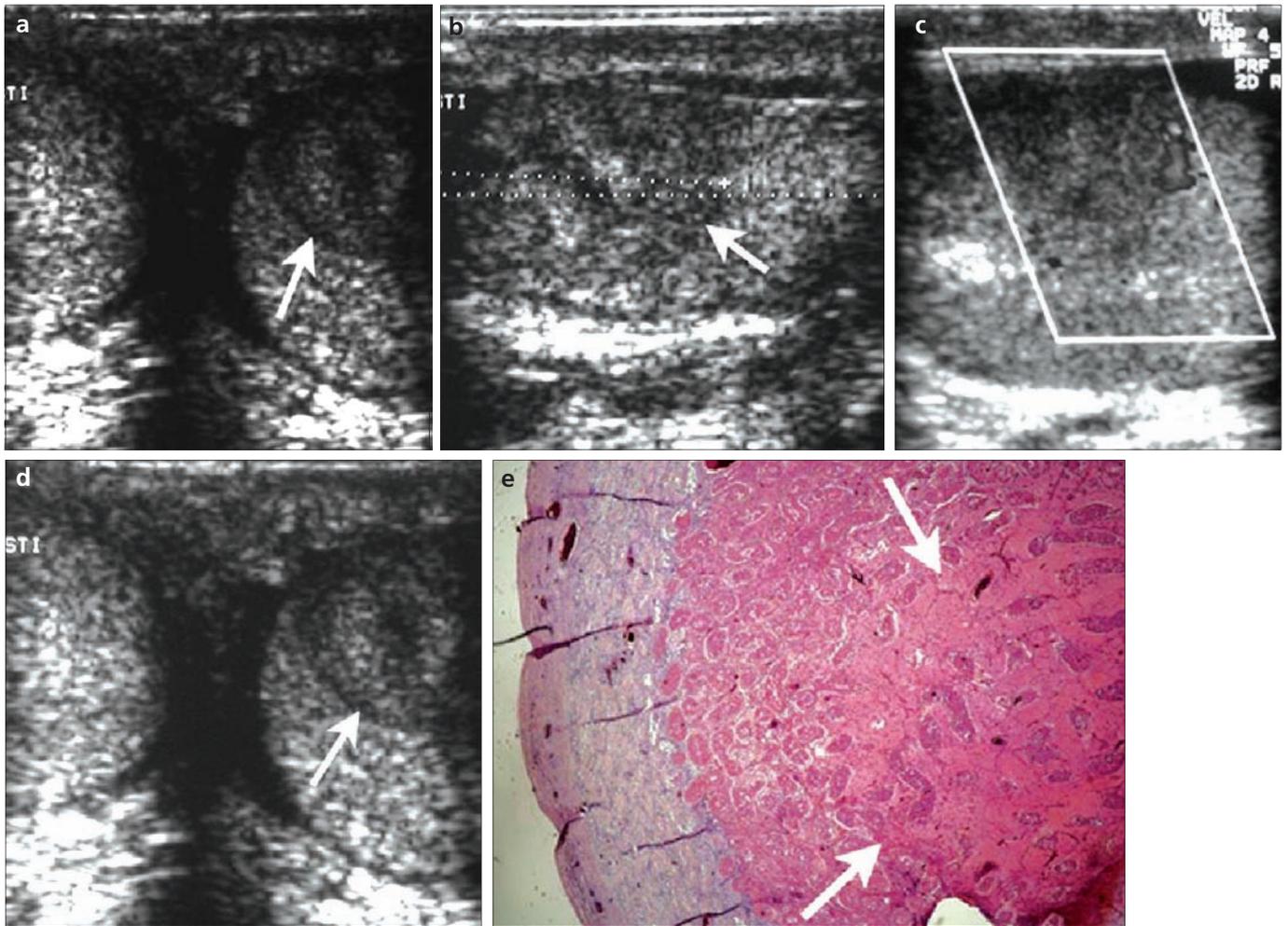
Figure 10. a–e. Focal testicular infarct. A 68-year-old man on coumadin presented with testicular pain for one month and no prior history of trauma. Tranverse **(a)** and longitudinal **(b)** gray scale images of the scrotum demonstrate a focal, well-circumscribed "target" lesion *(arrows)* in the right testis with concentric areas of alternating hypo and isoechoic rings and a central hypoechoic focus. Color Doppler image **(c)** demonstrates the absence of blood flow within the lesion. The patient was treated conservatively. Follow-up transverse ultrasound imaging **(d)** demonstrated no change in size or appearance of the lesion. Orchiectomy was performed after one month because of continuing pain. Histopathology **(e,** x2.5) showed the presence of a necrotic zone *(arrows)* within the testis.

the third decade of life, and patients may present with an acute scrotum. It is most commonly idiopathic in origin (29) but may also occur secondary to other etiologies such as acute epididymo-orchitis, which can cause obstruction of the adjacent testicular blood supply (30). It has also been reported secondary to surgery for inguinal hernia repair (31, 32), vasectomy (33), or varicocelectomy (34). Other less common predisposing factors for segmental infarction include polycythemia (29), intimal fibroplasia of the spermatic artery (35), sickle cell disease (36) or sickle cell trait (37), hypersensitivity angiitis (38), and trauma. A bell clapper deformity leading to repeated torsion-detorsion episodes is also a predisposing factor for segmental testicular infarct (39).

The ultrasound appearance of a segmental infarct is that of a focal mixed echogenic or hypoechoic lesion that simulates a testicular tumor (40). In an acute presentation, the testis may appear enlarged, but it subsequently shrinks in size and, as a chronic presentation, will present as a unilaterally smaller testis. Color flow Doppler examination demonstrates absent vascularity within the region, thus distinguishing it from a tumor (Fig. 10). Difficulty arises in the case of small tumors that may also show low flow, thus mimicking a testicular infarct (40–42). Magnetic resonance imaging (MRI) has been found to be useful in distinguishing tumors from segmental infarcts by demonstrating the presence of an enhancing rim around a segmen-

tal infarct as well as the typical wedge shape of an infarct (43).

Some focal testicular infarcts may become hemorrhagic and are usually seen as echogenic areas within the infarct.

Fibrosis of testis

Testicular fibrosis can occur secondary to trauma, inflammation, or incomplete testicular torsion. Most testes with fibrosis are either small or normal-sized. Other causes of testicular fibrosis include radiation therapy (44) and post-biopsy changes (45). Sonographic features of fibrosis include a striated pattern, diffuse heterogeneity (not otherwise specified), focal hypoechoic masses, and unilateral or bilateral focal hyperechoic masses (Fig. 11) (45–48).
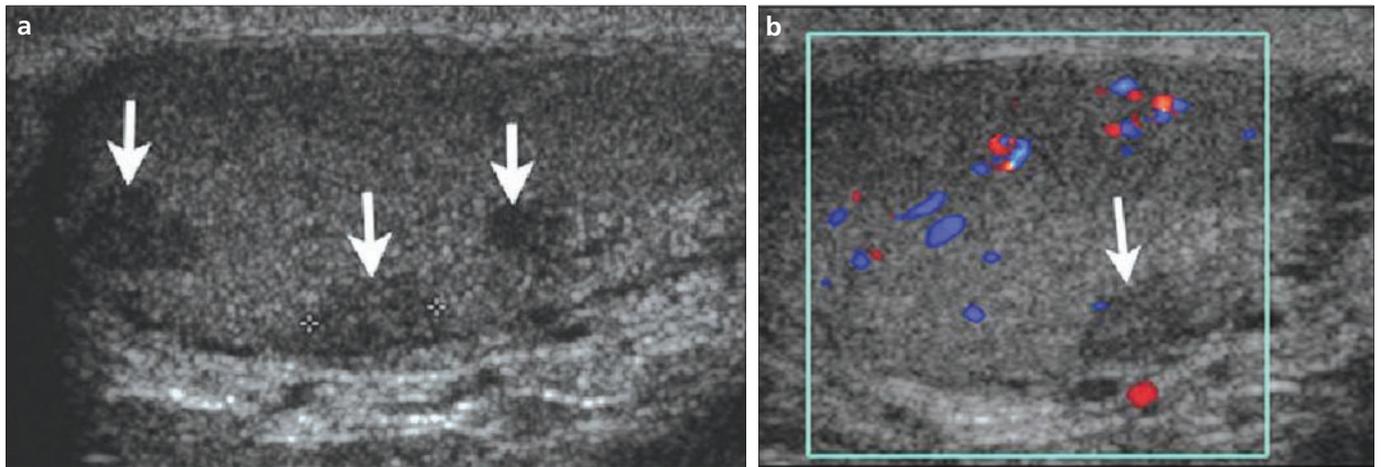
Figure 11. a–c. Testicular fibrosis. A 63-year-old male with prior history of a left orchiectomy for a seminoma and history of radiation therapy. Gray-scale **(a)** and color flow Doppler **(b)** ultrasound show normal-sized testis with multiple avascular hypoechoic masses *(arrows)*. The masses were found to be stable on follow-up ultrasound. Gray-scale sonogram of the testis in a 65-year-old male **(c)** with age related testicular fibrosis appearing as a striated pattern.
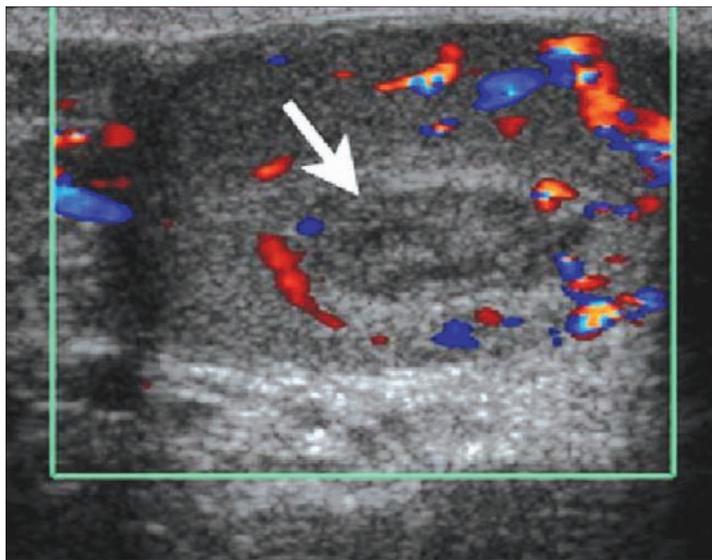
Figure 12. Intratesticular hematoma. A 24-year-old male with a history of trauma to the scrotum. Color flow Doppler image of the testis demonstrates an avascular hypoechoic mass *(arrow)* within the testis. The patient was managed conservatively, and the hematoma resolved on follow-up ultrasound imaging.

Testicular hematoma

Testicular hematomas are commonly seen secondary to trauma (Fig. 12) but can also be seen secondary to testicular biopsy. Other less common etiologies include bleeding diatheses, vascular pathology, thrombosis, vasculitides, and spontaneous testicular hemorrhage (Fig. 13) (49). Hematomas are most often acute in onset. Their appearance depends on the age of the hematoma; acute hematomas appear hyperechoic and subsequently become complex with cystic components. Hematomas appear avascular on color Doppler US (10).

Testicular hamartomas in Cowden's disease

Cowden's disease is also referred to as multiple hamartoma syndrome because of the associated occurrence of hamartomas. Hamartomas may arise from any of the germ cell layers and can occur anywhere in the body. Patients with Cowden's disease may also have testicular hamartomas (testicular lipomatosis) (50, 51). Lindsay et al. first described sonographic and MRI features of testicular hamartomas in Cowden disease (50). These lesions have no effect on fertility or testicular function (52).

Sonographic features include the presence of multiple, discrete, hyperechoic foci in both testes, varying in size from 1 to 6 mm. These are usually non-shadowing and demonstrate absent vascularity on color flow Doppler imaging (Fig. 14) (51). On MRI examination they demonstrate a high signal on a T1 weighted sequence, confirming the presence of fat (50). The main differential consideration on ultrasound examination is testicular microlithiasis, which also presents as multiple, bilateral, non-shadowing hyperechoic lesions (10). However, testicular microlithiasis lesions are clearly differentiated from testicular hamartomas by their size. Testicular microlithiasis is most often punctate, varies from 1 to 3 mm in size (51), and may not be visible on MRI (53).

Congenital testicular adrenal rests

Congenital testicular adrenal rests are seen in about 29% of patients with congenital adrenal hyperplasia (CAH) (54, 55). CAH is an autosomal recessive disease characterized by a deficiency of adrenocortical enzymes, particularly
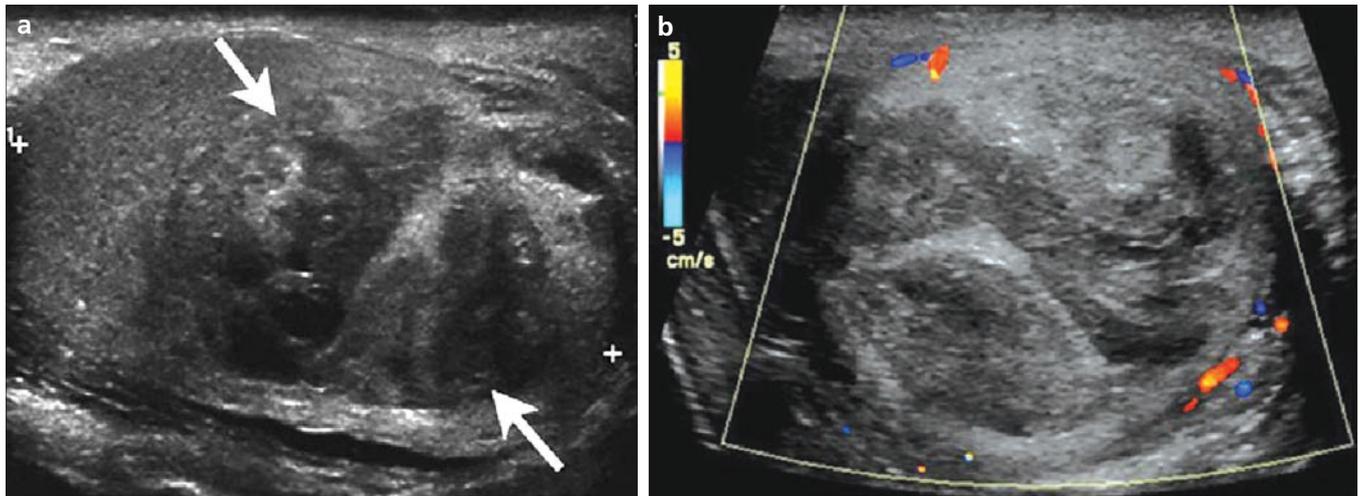
Figure 13. a, b. Spontaneous testicular hemorrhage. A 39-year-old male with a past history of left radical orchiectomy for sudden onset of testicular hemorrhage presented with sudden onset of right testicular mass. No preceding history of trauma. **(a)** Longitudinal gray scale and **(b)** transverse color flow Doppler images of the right testis demonstrate a mixed echogenic intratesticular mass *(arrows)* with ill-defined walls and internal avascularity. The patient underwent a right orchiectomy due to the large size of the lesion and constant pain. Pathology revealed the presence of a fresh testicular hemorrhage.
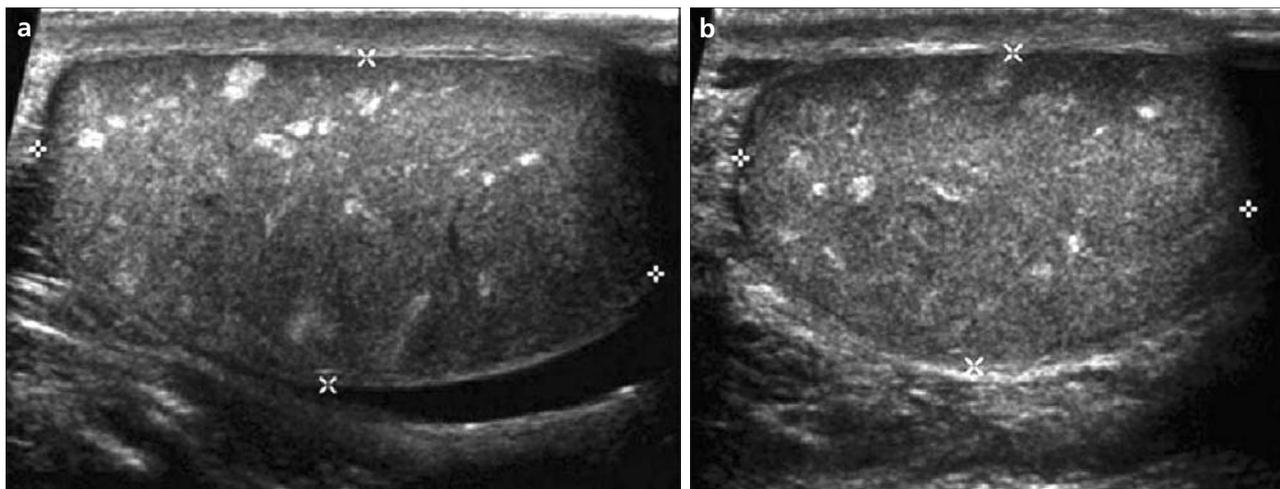

Figure 14. a, b. Testicular hamartomas in Cowden disease. A 38-year-old male with mucocutaneous lesions and mild testicular pain. Longitudinal gray scale images of the left **(a)** and right **(b)** testis demonstrate multiple hyperechoic lesions in the testicular parenchyma bilaterally with no acoustic shadowing.

21-hydroxylase. An increase in adrenocorticotropic hormone (ACTH) levels causes hyperplasia of adrenal remnants in the testes in patients with CAH (56) and results in the development of intratesticular masses. Sonographically, these masses appear as hypoechoic intratesticular masses in both testes, with or without posterior acoustic shadowing, depending on the degree of fibrosis (Fig. 15) (54). Intratesticular masses are typically located in the region of the mediastinum testis (in 86%) (55). Ultrasound is the modality of choice for their diagnosis; however, MRI can also assist as a problem-solving modality in some cases. Testicular adrenal rests appear isointense on T1- and hy-

pointense on T2-weighted images with a diffuse enhancement pattern after gadolinium administration (54, 57, 58). Bilateral, synchronous testicular tumors are extremely rare (about 1%) (59) and are the main differential consideration in bilateral testicular masses. Therefore, congenital adrenal rests must be considered in patients with CAH and clinically followed by ultrasound to demonstrate stability over time. These masses typically regress with treatment.

Tuberculoma

There is an overall increase in the incidence of tuberculosis (TB) worldwide that is associated with a result-

ant increase in extra-pulmonary TB. The genitourinary tract is the most common site of extra-pulmonary TB which includes involvement of the kidneys, ureters, bladder, testes, and epididymides. The incidence of tuberculous epididymo-orchitis secondary to intravesical Bacillus Calmette-Guerin (BCG) therapy for bladder cancer has been reported (60). The testis and epididymis are usually affected concomitantly, but several recent reports indicate isolated epididymal involvement as well (61). The most common finding in TB is an enlarged epididymis with calcification (24). Tuberculous involvement of the testis is variable. It may involve the whole
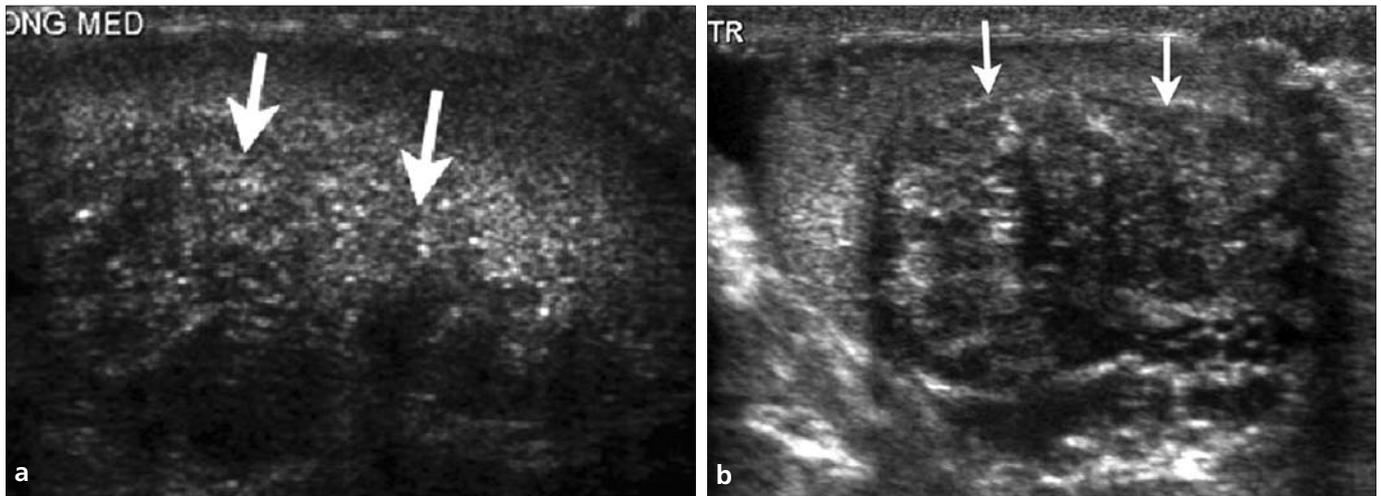
Figure 15. a, b. Congenital testicular adrenal rests. A 39-year-old male with infertility. Gray-scale ultrasound images of the left **(a)** and right **(b)** testes demonstrate bilateral hypoechoic masses *(arrows)* with some posterior acoustic shadowing. These lesions were followed up by ultrasound at one month and six months and were found to be stable in both size and appearance. (Reprinted with permission from reference 54.)
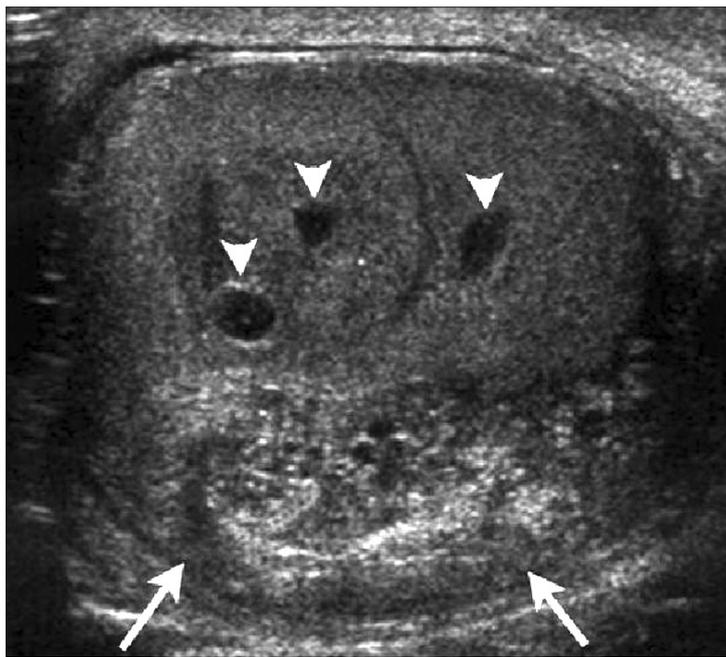

Figure 16. Granulomatous epididymo-orchitis (tuberculoma). A 35-year-old male with scrotal swelling and with a history of pulmonary tuberculosis. Longitudinal gray scale image of the scrotum (testis and epididymis) demonstrates an enlarged, heterogeneous-appearing epididymis *(arrow)*. There is also evidence of multiple hypoechoic lesions in the testis *(arrowheads)*.

testis and present as orchitis or form testicular abscesses, or hypoechoic nodules, called tuberculomas (Fig. 16) (62). Differentiation from other forms of granulomatous orchitis or an abscess is difficult on the basis of ultrasound features alone. Diagnosis is confirmed by culture or a fine needle aspiration biopsy to demonstrate the presence of acid fast tuberculous bacilli (62), which are treated conservatively with anti-tuberculous drugs.

Sarcoidosis

Sarcoidosis is a multisystemic chronic granulomatous (non-caseating) disease that presents with pulmonary manifestations in about 75% of cases. It is known for its variable systemic presentations (63, 64). Urologic manifestations are seen in only 5% of autopsy specimens (5). Patients with testicular sarcoidosis are usually asymptomatic and may present with a painless mass or the mass may be de-

tected incidentally while the patient is worked up for pulmonary sarcoidosis (65). Testicular sarcoidosis is particularly common in the African-American population (5).

Sonographically, sarcoid granulomas appear as single or multiple hypoechoic nodules within the testes and epididymis, mimicking testicular tumors (Fig. 17) (62). Recently, testicular sarcoidosis appearing as testicular appendices have been described (66). It may also present as epididymoorchitis (10). Although differentiation of sarcoidosis from tumors may be difficult, the presence of multiple bilateral lesions with the simultaneous involvement of the epididymis and testes, in conjunction with other systemic presentations such as pulmonary or abdominal involvement, should raise the suspicion of sarcoidosis. The patient should be worked up for either diagnosis before proceeding with an orchiectomy.

Conclusion

High-frequency ultrasound is the imaging modality of choice for the evaluation of testicular masses. Although most intratesticular masses are malignant, many benign lesions can also occur within the testes. Appropriate clinical history and sonographic features (gray-scale and color Doppler) almost always allow the correct diagnosis, thus helping to salvage the testis. Additionally, if ultrasound findings are indeterminate, MRI might aid in the diagnosis.
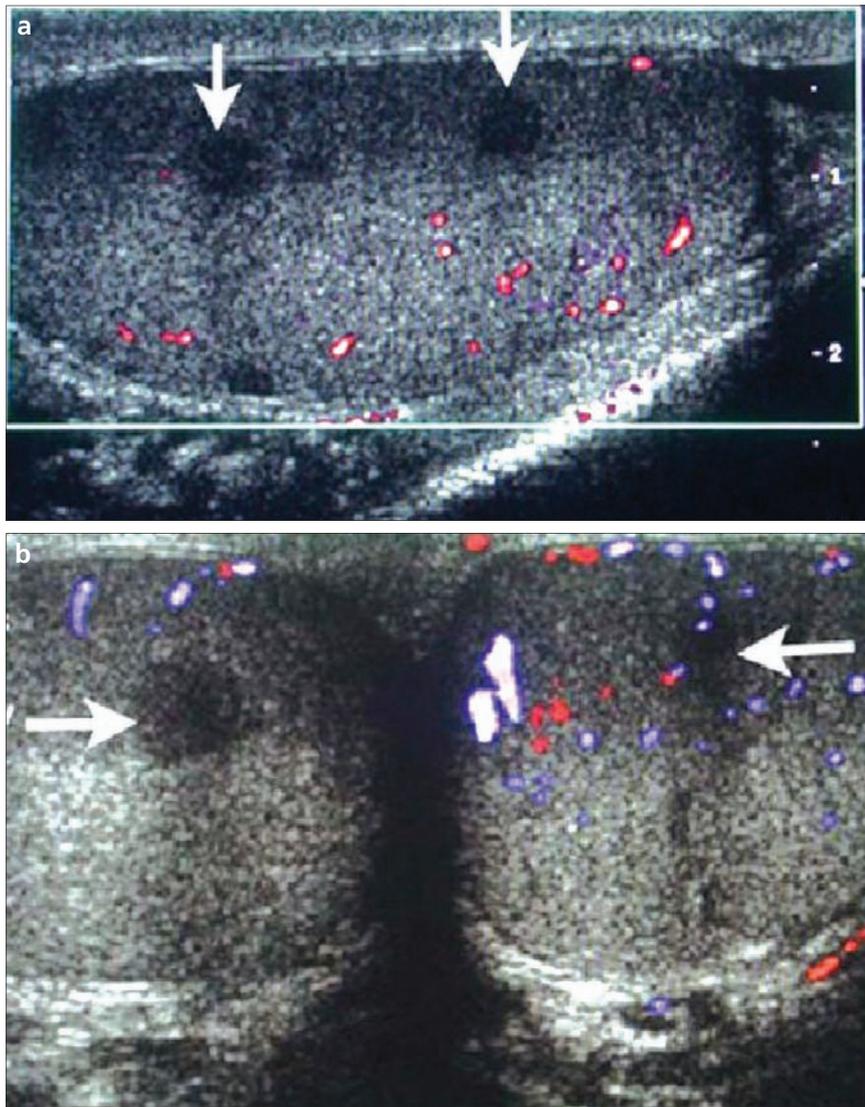
Figure 17. a, b. Sarcoidosis of testes. A 66-year-old white male with a past history of pulmonary sarcoidosis presented with right scrotal numbness and pain. Longitudinal **(a)** and transverse **(b)** color flow Doppler images of the testes demonstrate multiple, avascular, hypoechoic nodules *(arrows)* in the bilateral testes and bilateral epididymides (not shown). Follow-up ultrasound at one year demonstrated stability of the lesions.

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