Pictorial essay

High-resolution ultrasound in the evaluation of the nonacute testis

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Abstract
Ultrasound is the initial imaging modality used in the evaluation of the symptomatic testis. Ultrasound is painless and quick and supplements clinical examination of the testis. In this review, a range of testicular pathologies are discussed and sonographic examples illustrated. Particular attention is drawn to testicular microlithiasis and its relation to germ cell neoplasia and also to the sonographic features of epidermoid cysts that may allow testis-sparing surgery.

Key words: Ultrasound—Testis—Neoplasm—Microlithiasis.

Ultrasound is the initial imaging modality of choice in the assessment of a palpable testicular abnormality. It is readily available and noninvasive, and the testis itself is highly amenable to sonographic examination. In this review, the spectrum of pathologies that may be encountered in the nonacute testis are illustrated. Images were acquired using high-frequency (5–10 MHz) transducers.

Benign lesions

Epidermoid cysts
Epidermoid cysts (ECs) are relatively uncommon lesions that constitute approximately 1% of testicular tumors [1]. They usually present in males aged 20–40 years [2]. The histogenesis of these tumors is uncertain but is thought to represent a “monolayer teratoma,” hence implying an origin from a single cell line but with a malignant potential [2]. The tumor has previously been described in association with intratubular germ cell neoplasia and frank germ cell tumors. However, a recent review of the histology of 10 ECs failed to show any malignant change in the adjacent tissues [3]. Current opinion suggests that most ECs are derived from epithelial rests or inclusions and are not a part of the malignant spectrum [4]. They comprise layers of keratin lined by simple squamous epithelium. On ultrasound the lesions are well defined and avascular, with no surrounding parenchymal distortion [5] (Fig. 1). They can also be multiple and bilateral [6, 7]. They are frequently of mixed or decreased echogenicity, depending on the internal keratin content. The cysts may have an echogenic fibrous or calcified rim, and internal calcifications may also occur (Fig. 2). The sonographic appearances of epidermoids are not constant, but the “onion ring” pattern of alternating hyper- and hypoechogenicities has been well described [8] as is due to laminated layers of keratin [9] (Fig. 3). Sonographic appearances of epidermoids have recently been classified into four types: I, onion-ring pattern; II, densely calcified mass; III, cyst with rim peripheral or central calcification; and IV, mixed pattern [4]. If a potential epidermoid cyst is identified, then testis-sparing surgery may be performed with an on-table frozen section and biopsies of the surrounding parenchyma to exclude associated testicular intraepithelial neoplasia. Because the features of epidermoid cyst are variable, it is recommended that all such lesions be excised, with biopsy of the surrounding normal tissue [5, 10, 11]. However, some investigators advocate a more conservative approach if a calcified lesion is identified in an elderly asymptomatic patient [4]. Other groups have advocated radical surgery in all such cases [2, 12, 13].

Benign cystic teratomas
These lesions are at the benign end of the teratoma spectrum. Ultrasound features suggestive of benign cystic teratoma include a well-circumscribed cystic lesion with a thin wall. Internal calcifications may occur (Fig. 4). Some investigators have advocated testis-sparing surgery in boys with possible benign cystic teratoma on ultra-
sound, normal tumor markers, and biopsy-proven normal surrounding parenchyma at operation [14].

**Testicular cysts**

Simple intratesticular cysts are relatively common, and they occur in about 8–10% of patients. They are sonographically well defined, thin walled, and anechoic, with distal acoustic enhancement (Fig. 5). The etiology is unknown but may be posttraumatic or postinflammatory in origin [15]. If a lesion meets the sonographic criteria of a simple cyst, then further follow-up is not required [16].

Tubular ectasia of the rete testis is usually a distinctive ultrasound finding that may be bilateral where cystic changes are seen in the mediastinum of the testis (Fig. 6), and they are often accompanied by epididymal cysts. The