Sonographic findings of intratesticular neoplasms

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Learning objectives

To review and illustrate the sonographic findings of the different types of testicular tumors.
Background

The initial approach in the evaluation of scrotal pathology must be done by ultrasound. It is easily performed, has been shown to be nearly 100% sensitive in the identification of scrotal masses. [1, 2] and allows us to analyze its location and characteristics. The extra-testicular scrotal masses are mostly benign, while the intra-testicular are almost always malignant.

Sonography of the scrotum should be performed with the highest frequency linear transducer that gives adequate penetration (7.5-15-MHz). If greater penetration is needed because of scrotal swelling, a 6.0-MHz or lower frequency may be used. Patients are usually examined in the supine position. On sonograms, the normal testis has a homogeneous, medium-level, granular echotexture (fig. 1).

The covering tunica albuginea is generally not seen as a separate structure; however, where it invaginates to form the mediastinum testis, it can be seen as an echogenic line emanating from the posterior aspect of the testis (Fig 2). The epididymis is isoechoic or slightly hyperechoic compared with the testis [1].
Testicular neoplasms represent 1-2% of all malignancies in men, being particular common in young adults, ranking as the most common malignancy and the fifth most frequent cause of death in men aged 15 to 34 years. Testicular tumors can be further categorized into Germ cell (GCT) and Non-germ cell tumors. Germ cell tumors arise from spermatogenic cells and constitute 95% of testicular neoplasms. They are almost uniformly malignant. Non-germ cell primary tumors of the testis derive from the sex cords (Sertoli cells) and stroma (Leydig cells). These tumors are malignant in only 10% of cases. Nonprimary tumors such as lymphoma, leukemia, and metastases can also manifest as testicular masses. [2]

**GERM CELL TUMORS:** GCT are distributed between pure seminomas (no nonseminomatous elements present), and all others, which together are termed nonseminomatous germ cell tumors (NSGCTs). NSGCTs may contain pure components (ie, only one subtype of malignant germ cell is present), or more commonly, they may
consist of a heterogeneous mixture of two or more histologic subtypes. Distinction of these various subtypes of germ cell neoplasia is primarily a morphologic diagnosis, and the use of immunohistochemical stains should be reserved for difficult cases and not for routine diagnosis [3]. Pure seminomas account for approximately 50 percent of all testicular GCTs, and a seminomatous component is present in approximately 20 percent of mixed GCTs. Approximately one-third of all testicular germ cell tumors (GCTs) are mixed, with two or more germ cell tumor types present within a single mass. Pure embryonal carcinoma accounts for about 2 percent of all testicular GCTs, but it is a histologic component of approximately 85 percent of all mixed GCTs. [3]

**SEX CORD-STROMAL TUMORS:** Testicular sex-cord stromal tumors (SCSTs) show differentiation towards Leydig cells, Sertoli cells, and/or other types of sex cord-stromal cells (eg, granulosa cells). SCSTs are much less common than GCTs, accounting for less than 5 percent of all testicular neoplasms in adults, but are somewhat more common in prepubertal males. In contrast to testicular GCTs, assessing the potential for malignant behavior is often difficult for SCSTs. Nevertheless, studies have shown that the likelihood for a given tumor to display malignant or metastatic behavior increases in the presence of local or vascular invasion, large size (ie, greater than 5 cm), large numbers of mitotic figures, cytologic atypia, and necrosis. Leydig cell tumors are the most common type of testicular SCST. Up to 20 percent of Leydig cell tumors in adults are classified as malignant, based predominantly upon large size, vascular invasion, and increased mitotic activity. Malignant behavior has not been documented in children. [3]

**LYMPHOMA:** Primary testicular lymphoma is a unique and aggressive extranodal non-Hodgkin lymphoma with a high incidence of bilateral involvement, and a propensity for extranodal spread to the skin, subcutaneous tissue, bone marrow, central nervous system, and lung. In men over 60 years old, malignant lymphoma is the most common cause of a testicular mass. [3]
Images for this section:

**Fig. 0:** Longitudinal scan showing normal testicular echotexture

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Fig. 0: Mediastinum testis (arrow)

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Imaging findings OR Procedure details

A retrospective review of all patients who underwent orchietomy at our hospital during a period of 5 years for testicular cancer was performed. From the 44 Radical Orchietomies preformed, 15 were because of neoplastic pathology. All cases were confirmed histologically.

Our series:

Tumors of the germline (Seminomas and Non-seminomas) were the most common type, accounting for 86% of the cases, while stromal tumors account for 7% and Lymphoid tumors for the remaining 7%. (Fig. 1). Seminomas represented half of the germ line tumors while mixed malignant germ cell tumors and embryonal cell carcinoma accounted for the remaining cases (Fig. 2).

Fig.: Pathological Classification

References: Imagiology, Hospital de Santarém - Grijó. V. N. de Gaia/PT
**Fig.** Pathological Classification of GCT.

**References:** Imagiology, Hospital de Santarém - Grijó. V. N. de Gaia/PT

Germline tumors tend to occurred in younger individuals, with Seminomas arising in slightly older individuals when compared with Non-seminomas (Fig. 3).

**Fig.** Age distribution
Most tumors presented as a single nodule but in 29% of the cases there were more than one nodule (Fig. 4). Hypoechogenicity was a feature common to almost all tumors. Only in one case a tumor presented as a hyperechoic nodule.

![Nodularity Chart]

**Fig.:** Presentation of tumor - nodularity  
**References:** Imagiology, Hospital de Santarém - Grijó. V. N. de Gaia/PT

**Imaging findings:**

- **Germ line tumors:**
  
  - **Seminoma:** the characteristic imaging was a single, well defined and slightly heterogeneous nodule (fig. 5), in some cases, because of necrotic degeneration, tumors presented as a heterogeneous mass, replacing almost all the testis (fig. 6). In one case a Seminoma was hyperechogenic with some cysts and microcalcifications inside it (fig. 7).
**Fig.**: Seminoma - Longitudinal scan of the right testis shows a hypoechoic and slightly heterogeneous, well defined nodule in the upper pole.

**References**: Imagiology, Hospital de Santarém - Grijó. V. N. de Gaia/PT

**Fig.**: Necrotic Seminoma - Heterogeneous mass replacing the testicle

**References**: Imagiology, Hospital de Santarém - Grijó. V. N. de Gaia/PT
Fig.: Atypical seminoma - hyperechogenic lesion with microcalcifications and microcysts.

References: Imagiology, Hospital de Santarém - Grijó. V. N. de Gaia/PT

- Non seminomatous germ line tumors:

Embryonal cell carcinoma: the ultrasonographic appearance is similar to those of mixed NSGCT but they tend to be less heterogeneous (Fig 8). In our series we also had an atypical presentation with an increase in dimensions of the testis without a defined nodule (Fig 9).

Fig.: Embryonal cell tumor - solid, well defined and vascularized hypoechoic nodular lesion

References: Imagiology, Hospital de Santarém - Grijó. V. N. de Gaia/PT
Fig.: Atypical embryonic cell tumor: left testicle increased in dimensions with heterogeneity of its echotexture

**References:** Imagiology, Hospital de Santarém - Grijó. V. N. de Gaia/PT

**Mixed germ cell tumors:** the sonographic appearance of these tumors reflects their histologic features and they tend to be more heterogeneous, they may have solid and cystic components and calcifications are common (Fig. 10).
Fig.: Mixed germ cell tumour - hypoechoic, heterogeneous, solid nodule with calcifications

References: Imagiology, Hospital de Santarém - Grijó. V. N. de Gaia/PT

- **Lymphoma**: the sonographic appearance of lymphomas is similar to Seminomas. Generally they are hypoechoic and homogeneous, and they tend to replace the testis (Fig. 11) but focal lesions can also occur (Fig. 12)
**Fig.**: Lymphoma - diffuse hypoechoic diffuse involvement of the testis

**References**: Imagiology, Hospital de Santarém - Grijó. V. N. de Gaia/PT
Fig.: Lymphoma - homogeneous hypoechoic solid focal lesion

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Images for this section:

**Fig. 0:** Pathological Classification

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![Pathological Classification](image_url)

![Pathological Classification - Germ Cell tumors](image_url)
**Fig. 0:** Pathological Classification of GCT.

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![Age distribution chart](image)

**Fig. 0:** Age distribution

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![Nodularity chart](image)

**Fig. 0:** Presentation of tumor - nodularity
Fig. 0: Seminoma - Longitudinal scan of the right testis shows a hypoechoic and slightly heterogeneous, well defined nodule in the upper pole.

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Fig. 0: Necrotic Seminoma - Heterogeneous mass replacing the testicle

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Fig. 0: Atypical seminoma - hyperechogenic lesion with microcalcifications and microcysts.

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Fig. 0: Embryonal cell tumor - solid, well defined and vascularized hypoechoic nodular lesion

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Fig. 0: Atypical embryonic cell tumor: left testicle increased in dimensions with heterogeneity of its echotexture

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Fig. 0: Mixed germ cell tumour - hypoechoic, heterogeneous, solid nodule with calcifications
Fig. 0: Lymphoma - diffuse hypoechoic diffuse involvement of the testis

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**Fig. 0:** Lymphoma - homogeneous hypoechoic solid focal lesion

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Conclusion

Knowledge of sonographic findings of the various testicular tumors is helpful for differential diagnosis and can be helpful to predict their histological classification, however there is a very significant overlap of their features. Solid, hypoechoic and heterogeneous intra-testicular nodules are extremely suggestive of malignancy.
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